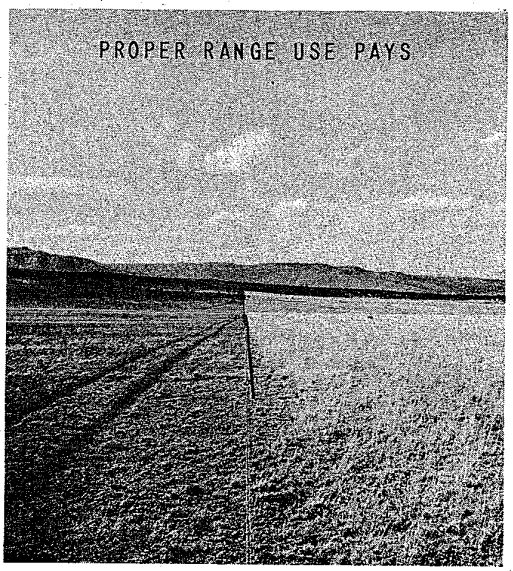
RANGE CONSERVATION - TECHNICAL NOTES



U. S. DEPARTMENT OF AGRICULTURE
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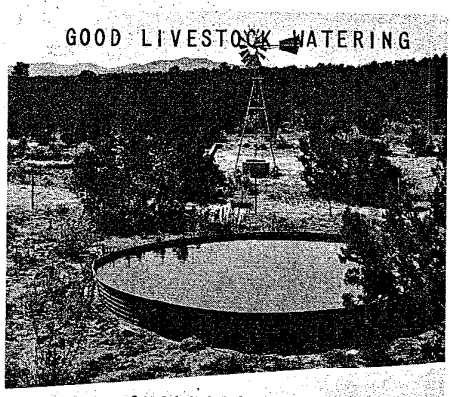
NEW MEXICO



RANGE TECHNICAL NOTE NO. 36

Subject: RANGE - Reports - Water Intake on Rangelands

The following material is the Summary from "Water Intake on Midcontinental Rangelands as Influenced by Soil and Plant Cover," Technical Bulletin No. 1390, prepared by the Agricultural Research Service and Soil Conservation Service in cooperation with Wyoming Agricultural Experiment Station. This paper was authored by Frank Rauzi and C. L. Fly, soil scientist and formerly soil scientist, respectively, Soil and Water Conservation Research Division, Agricultural Research Service, and E. J. Dyksterhuis, formerly range conservationist, Soil Conservation Service. The New Mexico range sites(site) have been inserted for each range-soil-group discussed.

Distribution:
Area Conservationists
District Conservationists
Range Conservationist, Portland
Dan Merkel, Santa Fe
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11-64 4-L-19447

SUMMARY

"Water intake studies were conducted with a mobile raindrop applicator on rangeland sites in six States in the Northern and Central Plains. Tests were designed to measure the effect of vegetational differences on the water intake of comparable soil mapping units at range fenceline contrasts. In addition, concentrations of tests were made on certain small experimental rangeland watersheds containing permanent hydrologic installations.

Results of 670 tests on nine range-soil-groups located throughout a wide range in precipitation zones and latitudes were evaluated. Statistical analyses of the data included simple and multiple stepwise regressions. Equations were developed for estimating water intake rates for each range-soil-group. The following results were obtained from the study.

1. Average rate of water intake during the second 30-minute period of the 1-hour test for all range sites was 1.35 inches per hour. Total vegetal cover averaged 2,458 pounds per acre. Neither average is weighted for relative areas of range sites.

2. Water intake rates at their extremes were lowest on the range sites characterized by fine-textured dispersed soils, and highest on the range sites characterized by coarse-textured soils. These rates were for saline-alkali clays of Wyoming desert ranges (0.2 in. per hr.) and deep sands of Nebraska Sandhill ranges (4.8 in. per hr.).

3. The amounts and kinds of vegetal cover varied within a local range-soil-group because of differences in range condition and current degree of use. Different climatic conditions and associated soil conditions were associated with differences in plant cover of a range-soil-group over broad areas.

4. Among all variables measured, the amount of both new and old vegetation showed greatest general correlation with water intake rate. Simple correlations between water intake rates during the second 30-minute period of the 1-hour test showed also that soil structure of the first horizon was highly correlated with water intake. Texture of the second horizon was next in order of importance, followed by the nature of the boundary of the first horizon.

5. Within the same geographic area and precipitation zone, herbage production of a range soil is related to soil characteristics that can be modified by grazing management, especially soil structure.

6. Average water intake rates of saline-alkali upland (Salt Flats) range sites studies were 0.36, 0.26, and 0.20 inch per hour for the Montana, South Dakota, and Wyoming sites, respectively. Total vegetal cover, including woody stems, for the three sites ranged from 820 to 1,360 pounds per acre. Of the factors studied, water intake rates appeared to be influenced more by vegetative than by soil factors.

7. In western South Dakota, the water intake rate of a dense clay (clayey) range site averaged 0.50 inch per hour. Total vegetal cover averaged 1,653 pounds per acre. Departures from average water intake rate showed best correlation with differences in vegetal cover as compared with differences in soil properties.

8. The water intake rates on the interareas (Loamy and Clayey) of a panspot range site in western South Dakota averaged 0.90 inch per hour. Total vegetal cover averaged 1,845 pounds per acre. As on dense clay, the vegetative factors influenced the water intake rate more than did the soil factors.

9. Intake was evaluated for a complex of shallow (Shallow) range-soil-groups which included all the shallow sites studied in Montana, Wyoming, South Dakota, Nebraska, and Kansas. Water intake rates ranged from 1.18 to 1.53 inches per hour with an average of 1.26 inches per hour. Four precipitation zones were involved. Total vegetal cover for the four precipitation zones average 2,205 pounds per acre. The vegetative and soil factors studied appeared to have equal influence on the water intake rate.

10. The water intake characteristics of the clayey (Loamy and Clayey) range-soil-group were studied in Montana, Wyoming, South Dakota, and Kansas and in four precipitation zones. Average water intake rate ranged from 1.13 to 1.53 inches per hour. Total vegetal cover for the four areas averaged 2,147 pounds per acre. The vegetative and soil factors equally influenced water intake rates.

11. Water intake rates for the silty (Loamy) range-soil-group were investigated in Montana, Wyoming, North Dakota, South Dakota, Nebraska, Kansas and in seven different precipitation zones. These included the 5- to 9-inch through the 35- to 39-inch precipitation zones. Average water intake ranged from 1.03 to 1.77 inches per hour or an average of 1.46 inches per hour for the seven precipitation zones. Total vegetal cover ranged from 1,297 to 4,629 pounds per acre. Water intake rates were influenced more by vegetative than by soil factors.

12. The water intake rates of the sandy (Sandy) range-soil-group were investigated in Nebraska, western South Dakota, and Wyoming and involved three precipitation zones. Average water intake rate for the three areas was 1.67 inches per hour. Total vegetal cover averaged 2,438 pounds per acre. Water intake rate was influenced more by vegetative than by soil factors.

13. In Kansas and Nebraska, water intake characteristics of the overflow sites were studied. Average water intake rate was 2.31 inches per hour. Total vegetal cover averaged 5,348 pounds per acre. Soil factors influenced water intake rates more than did the vegetative factors. This is the New Mexico Bottomland site.

14. Sands (Deep Sand) range sites were studied in Nebraska, Kansas, and Wyoming and occurred in four different precipitation zones. These sites are characterized by topsoils of true sands, as distinguished from merely sandy topsoils. Some were deep sands but others had topsoils of finer textures. Water intake rate ranged from 0.69 to 4.83 inches per hour, or an average of 3.13 inches per hour. Total vegetal cover averaged 3,197 pounds per acre. Soil factors influenced water intake rate more than did the vegetative factors.

15. Analysis of the data from all tests showed that water intake rate in the second 30 minutes of simulated rainfall was most clearly correlated with either total vegetal cover or total weight of herbage. Soil structure was the most important soil influence measured.

16. Water intake rate, range condition class, and herbage production tended to vary together for a specific type of range site. Rates of intake and amounts of herbage also varied among the range sites described."

From the data outlined in this paper, the following general statements may be made:

1. Soil factors influence water intake rates more than vegetation on the Bottomland and Deep Sand sites.

2. On the Salt Flats, Clayey, Loamy, and Sandy range sites, vegetation influences water intake rates more than soil factors.

3. There is an equal influence of soil and vegetation on water intake on the Shallow site.